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GENALIGN - Multiple Sequence Alignment Program
Release 5.4

Thu 6 Apr 106 9:54:42-PST

Solution Parameters:

    Nucleic Alphabet    = Identity
    Output line length  = 80
    Compress            = Off
    Histogram           = Off
    Randomization       = Off

    AMINO-Res-length    = 2
    DELetion-weight     = 5.00
    LEngth-factor       = 0
    Matching-weight     = 1.00
    NUCLBIC-Res-length  = 4
    SPread-factor       = 50

Clustered order of selected sequences:

    4.  US-10-659-983A-4    (1-1460)
    3.  US-10-659-983A-3    (1-1458)
    1.  US-10-659-983A-1    (1-1457)
    2.  US-10-659-983A-2    (1-1457)
    5.  US-10-659-983A-18   (1-1467)
    7.  US-10-659-983A-20   (1-1491)
    6.  US-10-659-983A-19   (1-1494)
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Region Alignment: (listed in Clustered order)

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US-10-659-   1                      ATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                                    ||||||||||||||||||||||||||||||||||||||||||||
US-10-659-   1             ATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                          ||||||||||||||||||||||||||||||||||||||||||||
US-10-659-   1             ATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                          ||||||||||||||||||||||||||||||||||||||||||||
US-10-659-   1             ATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                          ||||||||||||||||||||||||||||||||||||||||||||
US-10-659-   1             ATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                          ||||||||||||||||||||||||||||||||||||||||||||
US-10-659-   1     TTGATCATGGCTCAGATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-   1   GTTTGATCATGGCTCAGATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-   1 aGTTTGATCATGGCTCAGATTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus        agtttgatcatggctcagaTTGAACGCTGGCGGCCATGCTTTACACATGCAAGTCGAACGGC

US-10-659-  44   AGCggGG   GcttcggCCTGccGGCGAGTGGCGAACGGGTGAGTAATACATCGGAAACGTgT
                 |||   ||          |||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  44   AGCACGG   GggcaacCCTGGTGGCGAGTGGCGGACGGGTGAGTAATACATCGGAACGTAT
                 |||   ||          |||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  44   AGCACCGGATGCTTGCATCTGGTGGCGAGTGGCGGACGGGTGAGTAATACATCGGAACGTAT
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  44   AGCACCGGATGCTTGCATCTGGTGGCGAGTGGCGGACGGGTGAGTAATGCATCGGAACGTAT
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  59   AGCACGGGTGCTTGCACCTGGTGGCGAGTGGCGGACGGGTGAGTAATGCATCGGAACGTGT
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  61   AGCACGGGTGCTTGCACCTGGTGGCGAGTGGCGGACGGGTGAGTAATGCATCGGAACGTGT
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  62   AGCACGGGTGCTTGCACCTGGTGGCGAGTGGCGGACGGGTGAGTAATGCATCGGAACGTGT
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus        AGCacGGgtGcttgcaccTGgtGGCGAGTGGCGGACGGGTGAGTAATgCATCGGAACGTgT

US-10-659- 103   CCTtaAGtGGGGaATAACGCAtCGAAAGaTGTGCTAATACCGCATA TCTCtgaGGAGAAA
                 | || |||||||| |||||||  ||||| ||||||||||||||||||  |||| ||||||||
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US-10-659-  103   CtTcgAGgGGGGATAACGCAcCGAAAGgTGTGCTAATACCGCATAaTCCTACGGAGAAA
                  | || ||||||||||||||||  ||||| ||||||||||||||||| |||| ||||||||
US-10-659-  105   CCAGAAGAGAGGGGTAACGCGGTAACGCATCGAAAGATGTGCTAATACCGCATAACTCTAAGGAGGAA
                  |||||||||||||||||||||  |||||||||||||||||||||||||| |||| |||||||||
US-10-659-  105   CCAGAAGAGAGGGGTAACGCGGTAACGCATCGAAAGATGTGCTAATACCGCATAACTCTAAGGAGGAA
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  120   CCAGAAGTGGGGGATAACGCATCGAAAGATGTGCTAATACCGCATAATCCTACGGAGGAA
                  |||||||  |||||||||||||||||||||||||||||||||||||||| |||| |||||||
US-10-659-  122   CCAGAAGTGGGGGATAACGCATCGAAAGATGTGCTAATACCGCATATTCTCTACGGAGGAA
                  |||||||  |||||||||||||||||||||||||||||||||||||||  |||| |||||||
US-10-659-  123   CCggAAGTGGGGGATAACGCATCGAAAGATGTGCTAATACCGCATATTCTCTACGGAGgAA
                  ||  |||  |||||||||||||||||||||||||||||||||||||||  |||| ||||| ||
consensus         CcagaAgtGGGGgaTAACGCAtCGAAAGaTGTGCTAATACCGCATAttcTCtacGGAGgAA

US-10-659-  163   AGCAGGGGATCGCAAGACCTTGCGCTaaaGGAGaGGCGGCCGATGTCTGATTAGCTAGTTGGTG
                  |||||||||||||||||||||||||||  ||| |||||||||||||||||||||||||||||||
US-10-659-  164   AGCAGGGGATCGCAAGACCTTGCGCTcTTGGAGcGGCCGCTTGGAGCGGCCGATGTCTGATTAGCTAGTTGGTG
                  |||||||||||||||||||||||||| |||||| ||||  |||||||||||||||||||||||||||||||||||
US-10-659-  166   AGCAGGGGATCGAAAGACCTTGCGCTTTGGAGCGGCCGCTTTGGAGCGGCCGATGTCTGATTAGCTAGTTGGTG
                  ||||||||||  ||||||||||||||||||||||||||  ||||||||||||||||||||||||||||||||||
US-10-659-  166   AGCAGGGGATCGAAAGACCTTGTGCTTTGGAGCGGCCGCTTTGGAGCGGCCGATGTCTGATTAGCTAGTTGGTG
                  ||||||||||  |||||||||  ||||||||||||||||  ||||||||||||||||||||||||||||||||||
US-10-659-  181   AGCAGGGGATCGAAAGACCTTGTGCTTTGGAGCGGCCGCTTTGGAGCGGCCGATGTCTGATTAGCTAGTTGGTG
                  ||||||||||  |||||||||  ||||||||||||||||  ||||||||||||||||||||||||||||||||||
US-10-659-  183   AGCAGGGGATCGAAAGACCTTGTGCTTTGGAGCGGCCGCTTTGGAGCGGCCGATGTCTGATTAGCTAGTTGGTG
                  ||||||||||  |||||||||  ||||||||||||||||  ||||||||||||||||||||||||||||||||||
US-10-659-  184   AGCAGGGGATCGAAAGACCTTGTGCTTTGGAGCGGCCGCTTTGGAGCGGCCGATGTCTGATTAGCTAGTTGGTG
                  ||||||||||  |||||||||  ||||||||||||||||  ||||||||||||||||||||||||||||||||||
consensus         AGCAGGGGATCGaAAGACCTTGcGCttttGGAGCGGCCGCTTtttGGAGCGGCCGATGtCTGATTAGCTAGTTGGTG

US-10-659-  224   gGGTAaaGGCTTACCAAGGCaACGATCAGTAGtTGGTCTGAGAGGACGACCAaCCACACTG
                  |||| || ||||||||||||  |||||||||||||||||||||||||||||  |||||||||
US-10-659-  225   aGGTAAtGGCTTACCAAGGCGACGATCAGTAGCTGGTCTGAGAGGACGACCAGCCACACTG
                  ||||| || ||||||||||| ||||||||||||||||||||||||||||||||||||||||
US-10-659-  227   GGGTAAAGGCCTACCAAGGCGACGATCAGTAGTTGGTCTGAGAGGACGACCAGCCACACTG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  227   GGGTAAAGGCCTACCAAGGCGACGATCAGTAGTTGGTCTGAGAGGACGACCAGCCACACTG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  242   GGGTAAAGGCTACCAAGGCAACGATCAGTAGTTGGTCTGAGAGGACGACCAGCCACACTG
                  ||||||||| |||||||||  |||||||||||||||||||||||||||||||||||||||
US-10-659-  244   GGGTAAAGGCTACCAAGGCAACGATCAGTAGTTGGTCTGAGAGGACGACCAGCCACACTG
                  ||||||||| |||||||||  |||||||||||||||||||||||||||||||||||||||
US-10-659-  245   GGGTAAaGGCTACCAAGGCaACGATCAGTAGTTGGTCTGAGAGGACGACCAGCCACACTG
                  ||||| ||| |||||||||  |||||||||||||||||||||||||||||||||||||||
consensus         gGGTAAaGGCTACCAAGGCaACGATCAGTAGTTGGTCTGAGAGGACGACCAGCCACACTG

US-10-659-  285   GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAATGGGc
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  286   GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAATGGGg
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  288   GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAATGGGC
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  288   GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAATGGGC
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  303   GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAACGGGC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  305   GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAAtGGGc
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  306   GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAAtGGGc
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus         GGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATTTTGGACAAtGGGc

US-10-659-  346   GAAaGCCTGATCCAGCCATGCCGCGTGAGTGAAGAAGGCC  TTCGGGTTGTAgAGCTCTTT
                  |||  |||||||||||||||||||||||||||||||||||  |||||||||||| ||||||
US-10-659-  347   GAAACCCTGATCCAGCCATGCCGCGTGAGTGAAGAAGGCC  TTCGGGTTGTAAAGCTCTTT
                  ||| |||||||||||||||||||||||||||||||||||||  |||||||||||||||||||
US-10-659-  349   GCAAGCCTGATCCAGCAATGCCGCGTGAGTGAAGAAGGCC  TTCGGGTTGTAAAGCTCTTT
                  ||  |||||||||||| |||||||||||||||||||||||||  |||||||||||||||||||
US-10-659-  349   GCAAGCCTGATCCAGCAATGCCGCGTGAGTGAAGAAGGCC  TTCGGGTTGTAAAGCTCTTT
                  ||  |||||||||||| |||||||||||||||||||||||||  |||||||||||||||||||
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US-10-659-    610  CCTGGGAATTGCGTTTGAAACTACAAAGTGTAGCGAGAGGGGGTGGAATTCCATG
consensus          CCTGGGAAtTGCGTTTGAAACTACAAAGTGTaGCGAGAGGGggGTGGAATTCCATg

US-10-659-    650  TGTAGCAGTGAAATGCGTAGAGATGTGGAaGAACACCGATGGCGAGGCAGCtCCTGGGGT
US-10-659-    651  TGTAGCAGTGAAATGCGTAGAGATGTGAGgGAACCGATGGCGAGGCAGCCCCCTGGGGT
US-10-659-    653  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAGGCAGCCTCCTGGGGT
US-10-659-    653  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAGGCAGCCTCCTGGGGT
US-10-659-    667  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAGGCAGCCCCCTGGGGT
US-10-659-    670  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAGGCAGCCCCCTGGGGT
US-10-659-    671  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAGGCAGCCCCCTGGGGT
consensus          TGTAGCAGTGAAATGCGTAGAGATaTGGaaGAACAtCGATGGCGAaGGCAGCccccTGGGGT

US-10-659-    711  TgAACtGACGCTCAtGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCtGGTAGTC
US-10-659-    712  TAAACcGACGCTCAGGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC
US-10-659-    714  TAAACTGACGCTCATGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC
US-10-659-    714  TAAACTGACGCTCATGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC
US-10-659-    728  TAAACTGACGCTCATGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC
US-10-659-    731  TAAACTGACGCTCATGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC
US-10-659-    732  TAAACTGACGCTCATGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC
consensus          TaAACtGACGCTCAtGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC

US-10-659-    772  CACGCCCTAAACGATGTCAACTgGTTGTCCGatcTaaTcAaGGaCtTGGTAACGCAGCTAA
US-10-659-    773  CACGCCCTAAACGATGTCAACTAGTTGTCGG          GTCTTTAAcGGACTTGGTAACGCAGCTAA
US-10-659-    775  CACGCCCTAAACGATGTCAACTAGTTGTTGG          GCCTTATTAGGCTTGGTAACGAAGCTAA
US-10-659-    775  CACGCCCTAAACGATGTCAACTAGTTGTTGG          GCCTTATTAGGCTTGGTAACGAAGCTAA
US-10-659-    789  CACGCCCTAAACGATGTCAACTAGTTGTTGG          GCCTTACTAGGCTTGGTAACGTAGCTAA
US-10-659-    792  CACGCCCTAAACGATGTCAACTAGTTGTTGG          GCCTTACTAGGCTTGGTAACGTAGCTAA
US-10-659-    793  CACGCCCTAAACGATGTCAACTAGTTGTTGG          GCCTTACTAGGCTTGGTAACGTAGCTAA
consensus          TaAACTGACGCTCAtGCACGAAAGCGTGGGAGCAAACAGGATTAGATACCCTGGTAGTC

US-10-659-    833  CGCGTGAAGTTGaCCGGCTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-    832  CGCGTGAAGTTGgCCGGCTGGGGAGTACGGTCGCAGatTAAAACTCAAAGGAATTGACGG
US-10-659-    834  CGCGTGAAGTTGACCGGCTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-    834  CGCGTGAAGTTGACCGGCTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-    848  CGCGTGAAGTTGACCGGCTGGGGAGTACGGTCGCAagATTAAAACTCAAAGGAATTGACGG
US-10-659-    851  CGCGTGAAGTTGACCGGCTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-    852  CGCGTGAAGTTGaCCGGCTGGGGAGTACGGTCGCAaGATTAAAACTCAAAGGAATTGACGG
consensus          CGCGTGAAGTTGaCCGGCTGGGGAGTACGGTCGCAaGATTAAAACTCAAAGGAATTGACGG
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US-10-659-    364  GAAAGCCTGATCCAGCAATGCCCGCGTGAGTGAAGAAGC    TTCGGGTTGTAAAGCTCTTT
US-10-659-    366  GAAAGCCTGATCCAGCAATGCCCGCGTGAGTGAAGAAGG    CCTTCCGGGTTGTAAAGCTCTTT
US-10-659-    367  GAAAGCCTGATCCAGCAATGCCCGCGTGAGTGAAGAAGG    CCTTCGGGTTGTAaAGCTCTTT
consensus          GaAAgCCTGATCCAGCAATGCCCGCGTGAGTGAAGAAGGCCcTTCGGGtTGTAaAGCTCTTT

US-10-659-    406  tAGtCagAAgAAagaaTCatGatgAATAattaTGACTtcaTGaCGGTACtGacGAGAaaAG
US-10-659-    407  CAGcCGGAAcGAAAcGGTCAcGGGCtAATAccCGTGaCTGACTGaCGGTACcGacGAGAGAAG
US-10-659-    409  CAGTCGAGAAGAAAAGGTTACGGTAAATAATGACTCATGACGGTATCGaCAGAGAGAAG
US-10-659-    409  CAGTCGAGAAGAAAAGGTTACGGTAAATAATGaCcCATGACGGTATCGaCAGAGAGAAG
US-10-659-    423  CAGTCGAGAAGAAAAGGTTGTGACTAATAATCACAACTTATGaCGGTACCGaCAGAGAGAAG
US-10-659-    426  CAGTCGAGAAGAAAAGGTTGTGACTAATAATCACAACTTATGACGGTACCGaCAGAGAGAAG
US-10-659-    427  CAGTCGAGAAGAAAAGGTTGTGACTAATAATCACAACTTATGACGGTACCGaCAGAGAgAAG
consensus          cAGtCgagaAgAAAaggTtatGactAATAatcatgAActtaTGaCGGTAccGacAGAGAAG

US-10-659-    467  CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGAGCGTTAATCGGAAT
US-10-659-    468  CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGAGCGTTAATCGGAAT
US-10-659-    470  CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGAGCGTTAATCGGAAT
US-10-659-    470  CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGAGCGTTAATCGGAAT
US-10-659-    484  CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGAGCGTTAATCGGAAT
US-10-659-    487  CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGAGCGTTAATCGGAAT
US-10-659-    488  CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGCaAGCGTTAATCGGAAT
consensus          CACCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCGAGCGTTAATCGGAAT

US-10-659-    528  TACTGGGCGTAAAGGGCGCGTAGGCGGTTTTGTAAGTCAGATGTGAAAGCCCCGGGCTTAA
US-10-659-    529  TACTGGGCGTAAAGGGCGCGTAGGCGGTTTTGTAAGTCAGATGTGAAAGCCCCGGGCTTAA
US-10-659-    531  TACTGGGCGTAAAGGGCGCGTAGGCGGTTTGTAAGTCAGATGTGAAATCCCCGGGCTTAA
US-10-659-    531  TACTGGGCGTAAAGGGCGCGTAGGCGGCTTTGTAAGTCAGATGTGAAATCCCCGGGCTTAA
US-10-659-    545  TACTGGGCGTAAAGGGCGCGTAGGCGGCTTTGTAAGTCAGATGTGAAATCCCCGGGCTTAA
US-10-659-    548  TACTGGGCGTAAAGGGCGCGTAGGCGGCTTTGTAAGTCAGATGTGAAATCCCCGGGCTTAA
US-10-659-    549  TACTGGGCGTAAAGGGCGCGTAGGCGGCCTTGTAAGTCAGATGTGAAATCCCCGGGCTTAA
consensus          TACTGGGCGTAAAGGGCGCGTAGGCGGccttGTAAGTCAGATGTGAAATCCCCGGGCTTAA

US-10-659-    589  CCTGGGAATTGCGTTTGAAACTACAAAGTGcagCGAGAGGGGaTGGAATTCCATG
US-10-659-    590  CCTGGGAAcTGCGTTTGAAACTACAAAGGTGcaGCAGAGTGTGGCAGAGGGGGTGGAaTTCCACG
US-10-659-    592  CCTGGGAATTGCGTTTGAAACTACAAAGGCTAGAGCTAGAGTGTGGCAGAGGGGAGTGGAATTCCATG
US-10-659-    592  CCTGGGAATTGCGTTTGAAACTACAAAGGCTAGAGCTAGAGTGTGGCAGAGGGGAGTGGAATTCCATG
US-10-659-    606  CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTCTAGAGTGTAGCAGAGGGGGGTGGAATTCCATG
US-10-659-    609  CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTCTAGAGTGTAGCAGAGGGGGGTGGAaTTCCATG
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US-10-659-  1134  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC

US-10-659-  1149  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC

US-10-659-  1152  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC

US-10-659-  1153  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC

consensus         CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC

US-10-659-  1198  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCCAATCTCAGAAA

US-10-659-  1196  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA

US-10-659-  1195  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA

US-10-659-  1195  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA

US-10-659-  1210  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA

US-10-659-  1213  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA

US-10-659-  1214  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA

consensus         ACGTAATACAATGGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA

US-10-659-  1259  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  GCACCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

US-10-659-  1257  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  GCGCCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

US-10-659-  1256  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  GCGCCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

US-10-659-  1256  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  GCGCCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

US-10-659-  1271  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  GCGCCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

US-10-659-  1274  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  GCGCCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTaCGTGAAGTCGGAATCGCTAGTAA

US-10-659-  1275  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  GCGCCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

consensus         GCgCCGTCGTAGTCCGATCCGGATTGGAGTCTGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

US-10-659-  1320  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  TCGCGGATCAGCATGCCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659-  1318  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659-  1317  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659-  1317  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659-  1332  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659-  1335  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659-  1336  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

consensus         TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659-  1381  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CATGGGAGTTGGGTTTCACCAGAAGCAGGTAGTTTAACCGtAAGGAGGAcGGTTGCCACGGT

US-10-659-  1379  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CATGGGAGTTGGGTTTCACCAGAAGCAGGTAGTCTAACCGTAAGGAGGAGGGCGCTTGCCACGGT

US-10-659-  1378  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CATGGGAGTTGGGTTTCACCAGAAGCAGGTAGTCTAACCGTAAGGAGGAGGGCGCTTGCCACGGT

US-10-659-  1378  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CATGGGAGTTGGGTTTCACCAGAAGCAGGTAGTCTAACCGTAAGGAGGAGGGCGCTTGCCACGGT

US-10-659-  1393  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
                  CATGGGAGTTGGGTTTCACCAGAAGCAGATAGTCTAACCGTAAG AGGGCGTTGCCACGGc
```

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US-10-659-  894  GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  893  GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  895  GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  895  GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  909  GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  912  GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  913  GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
consensus        GGACCCGCACAAGCGGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA

US-10-659-  955  CCCTTGACATGcttgGAAtCtaGtgGAGAcaTaagaGaGTG  CCCGAAAAGGGAGCcaagACAC
                 |||||||||||||||||||||||||||||||||||||||||  ||||||||||||||||||||||
US-10-659-  954  CCCTTGACATGTACCGAAGCCCGCcGAGAggTggGtGTG   CCCGAAAAGGGAGCGCgtAACAC
                 |||||||||||||||||||||||||||||||||||||||   |||||||||||||||||||||||
US-10-659-  956  CCCTTGACATGTAGCGAATTTTCTAGAGATTAGTTAGTG C       TTCGGGAACGCTAACAC
                 ||||||||||||||||||||||||||||||||||||||| |       |||||||||||||||||
US-10-659-  956  CCCTTGACATGTAGCGAATTTTCTAGAGATTAGTTAGTG C       TTCGGGAACGCTAACAC
                 ||||||||||||||||||||||||||||||||||||||| |       |||||||||||||||||
US-10-659-  970  CCCTTGACATGTAGCGAATATTTTAGAGATAAAATAGTGCC       TTCGGGAACGCTAACAC
                 |||||||||||||||||||||||||||||||||||||||||       |||||||||||||||||
US-10-659-  973  CCCTTGACATGTAGCGAATATTTTAGAGATAAAATAGTGCC       TTCGGGAACGCTAACAC
                 |||||||||||||||||||||||||||||||||||||||||       |||||||||||||||||
US-10-659-  974  CCCTTGACATGTAGCGAATATTTTAGAGATAAAATAGTGCC       TTCGGGAACGCTAACAC
consensus        CCCTTGACATGtagcGAAtcatttaGAGAtaaaatagtGCccgttcgGGAacgctaaCAC

US-10-659- 1015  AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1014  AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1013  AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1013  AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1028  AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
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US-10-659- 1031  AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1032  AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
consensus        AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG

US-10-659- 1076  CGCAACCCTTGTCACTAATTGCtATCATTCTAaaTGaCACTTTAgTGAgACTTGCCGGTGA
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1075  CGCAACCCTTGTCATTATTGCCATCATTC AGTTGGGCACTTTAATGAaACTTGCCGGTGA
                 |||||||||||||||||||||||||||||| |||||||||||||||||||||||||||||||
US-10-659- 1074  CGCAACCCTTGTCATTATTGCCATCATT TGGTTGGGCACTTTAATGAGACTTGCCGGTGA
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US-10-659- 1074  CGCAACCCTTGTCATTATTGCCATCATT TGGTTGGGCACTTTAATGAGACTTGCCGGTGA
                 |||||||||||||||||||||||||||| ||||||||||||||||||||||||||||||||
US-10-659- 1089  CGCAACCCTTGTCATTATTGCCATCATT TAGTTGGGCACTTTAATGAGACTTGCCGGTGA
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US-10-659- 1092  CGCAACCCTTGTCATTATTGCCATCATT TAGTTGGGCACTTTAATGAGACTTGCCGGTGA
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US-10-659- 1093  CGCAACCCTTGTCAtTAATTGCCATCATTctagtTGggCACTTTAatgaGaACTTGCCGGTGA
consensus        CGCAACCCTTGTCAtTAATTGCCATCATTctagtTGggCACTTTAatgaGaACTTGCCGGTGA

US-10-659- 1137  CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1135  CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC
                 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1134  CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGCTTCAC
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US-10-659- 1396 CATGGGAGTGGGTTTCACCAGAAGCAGATAGTCTAACCGTAAGGAGGGCGTTTGCCACGGT
                |||||| ||| ||||||||||||||| ||| ||||||||  ||| ||  || |||||||
US-10-659- 1397 CATGGaAGTtGGCTgCACCAGAAGCAGGttGTCTAACCCTcgGGGAGGaCGcTTaCCACGGT

consensus       CATGGgAGTgGgtTtCACCAGAAGCAGAGtCTAACCgtaaGgAGGgCGcTTgCCACGGt


US-10-659- 1442 GgGggTCATGAC TGGGGTG
                | ||||||||||  ||||||
US-10-659- 1440 GAGATTCATGAC TGGGGTG
                |||||||||||| ||||||
US-10-659- 1439 GAGATTCATGAC TGGGGTG
                |||||||||||| ||||||
US-10-659- 1439 GAGATTCATGAC TGGGGTG
                ||||||||||||
US-10-659- 1453 GAGATTCATGAC TGG
                ||||||||||||
US-10-659- 1457 GAGATTCATGAC TGGGGTGAAGTCGTAACAAttA
                |||||||||| |  |||||||||||||||| ||
US-10-659- 1458 GtGgTcaATGACtTGGGGTGAAGTCGTAACAAggTAa

consensus       GaGattcATGACtTGGggtgaagtcgtaacaa--taa
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Alignment score = 7466.00

Scoring matrix:

	1	2	3	4	5	6	7
1		1454	1338	1300	1304	1220	1253
2			1335	1297	1303	1219	1252
3				1317	1226	1145	1177
4					1185	1111	1139
5						1304	1344
6							1450
7							

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!!NA_MULTIPLE_ALIGNMENT 1.0
PileUp of: us*

Symbol comparison table: GenRunData:pileupdna.cmp   CompCheck: 6876

          GapWeight: 5
    GapLengthWeight: 0

pileup_983.msf  MSF: 1499  Type: N  April 6, 2006 09:52  Check: 4192 ..

Name: us-10-659-983a-1    Len: 1499  Check: 4465  Weight: 1.00
Name: us-10-659-983a-2    Len: 1499  Check: 4156  Weight: 1.00
Name: us-10-659-983a-18   Len: 1499  Check: 2795  Weight: 1.00
Name: us-10-659-983a-20   Len: 1499  Check: 4660  Weight: 1.00
Name: us-10-659-983a-19   Len: 1499  Check: 3089  Weight: 1.00
Name: us-10-659-983a-3    Len: 1499  Check: 3801  Weight: 1.00
Name: us-10-659-983a-4    Len: 1499  Check: 1226  Weight: 1.00

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us-10-659-983a-1    ~~~~~~~~at tgaacgctgg cggcatgcct tacacatgca
us-10-659-983a-2    ~~~~~~~~at tgaacgctgg cggcatgcct tacacatgca
us-10-659-983a-18   ~~~ttgatca tggctcagat tgaacgctgg cggcatgcct tacacatgca
us-10-659-983a-20   ~gtttgatca tggctcagat tgaacgctgg cggcatgcct tacacatgca
us-10-659-983a-19   agtttgatca tggctcagat tgaacgctgg cggcatgcct tacacatgca
us-10-659-983a-3    ~~~~~~~~at tgaacgctgg cggcatgcct tacacatgca
us-10-659-983a-4    ~~~~~~~~at tgaacgctgg cggcatgcct tacacatgca

51                                                             100
us-10-659-983a-1    agtcgaacgg cagcacgggg gcttgcatct ggtggcgagt ggcggacggg
us-10-659-983a-2    agtcgaacgg cagcacgggg gcttgcatct ggtggcgagt ggcggacggg
us-10-659-983a-18   agtcgaacgg cagcacgggg gcttgcacct ggtggcgagt ggcggacggg
us-10-659-983a-20   agtcgaacgg cagcacgggg gcttgcacct ggtggcgagt ggcggacggg
us-10-659-983a-19   agtcgaacgg cagcacgggg gcttgcacct ggtggcgagt ggcggacggg
us-10-659-983a-3    agtcgaacgg cagcacgggg gcttgcatct ggtggcgagt ggcggacggg
us-10-659-983a-4    agtcgaacgg cag..cgggg gcttgcatct ggtggcgagt gccgcggacggg

101                                                            150
us-10-659-983a-1    tgagtaatgc atcggaacgt atccagaga gcatcgaaag
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us-10-659-983a-18   tgagtaatgc atcggaacgt gtccagaga gcatcgaaag
us-10-659-983a-20   tgagtaatgc atcggaacgt gtccacacct gcatcgaaag
us-10-659-983a-19   tgagtaatgc atcggaacgt gtccagaagt gcatcgaaag
us-10-659-983a-3    tgagtaatac atcggaacgt gtcccgggg gcatcgaaag
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151                                                            200
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us-10-659-983a-18   atgtgctaat accgccatt ctccacggag gaaagcaggg
us-10-659-983a-20   atgtgctaat accgccatt ctccacggag gaaagcaggg
us-10-659-983a-19   atgtgctaat accgcataat ctccgggag gaaagcaggg
us-10-659-983a-3    atgtgctaat accgcataat ctcctaagt gggaatac
us-10-659-983a-4    atgtgctaat accgccatat ctcctaagt gggaatac

201                                                            250
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us-10-659-983a-2    ccttgcgctt ttggagcggc cgatgtctga ttagctagt ggtggggta
us-10-659-983a-18   ccttgcgctt ttggagcggc cgatgtctga ttagctagt ggtggggta
us-10-659-983a-20   ccttgcgctc ttggagcggc cgatgtctga ttagctagt ggtggggta
us-10-659-983a-19   ccttgcgctc ttggagcggc cgatgtctga ttagctagt ggtggggta
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251                                                            300
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us-10-659-983a-18   aggcctacca agcgaacgat cagtagccgg tctgagagga cgaccagcca
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us-10-659-983a-19   aggcctacca agcgaacgat cagtagctgg tctgagagga cgaccagcca
us-10-659-983a-3    tgtcctacca agaggacgat cagtagctgg tctgagagga cgaccagcca
us-10-659-983a-4    aggcctacca agcaacgat cagtagctgg tctgagagga cgaccaacca
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301                                                            350
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us-10-659-983a-18   cactgggact gagacacggc ccagactcct acgggaggca gcagtgggga
us-10-659-983a-20   cactgggact gagacacggc ccagactcct acgggaggca gcagtgggga
us-10-659-983a-19   cactgggact gagacacggc ccagactcct acgggaggca gcagtgggga
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351                                                            400
us-10-659-983a-1    atttggaca atgggcgcaa gcctgatcca gccatgccgc gtgagtgaag
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us-10-659-983a-18   atttggaca atgggcgaaa gcctgatcca gccatgccgc gtgagtgaag
us-10-659-983a-20   atttggaca atgggcgaaa gcctgatcca gccatgccgc gtgagtgaag
us-10-659-983a-19   atttggaca acgggcgaaa gcctgatcca gccatgccgc gtgagtgaag
us-10-659-983a-3    atttggaca acgggggaaa cccgatcca gccatgccgc gtgagtgaag
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401                                                            450
us-10-659-983a-1    aaggccttcg ggttgtaaag ctcttttcagt cgagaagaaa aggttacggt
us-10-659-983a-2    aaggccttcg ggttgtaaag ctcttttcagt cgagaagaaa aggttacggt
us-10-659-983a-18   aagg.cttcg ggttgtaaag ctcttttcagt cgagaagaaa aggttgtgac
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451                                                            500
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us-10-659-983a-3    taataaccgt gactactgac ggtaccggaa cggaagagcac cggctaacta
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501                                                            550
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551                                                            600
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us-10-659-983a-18   ctgggcgcga tacgtcagat taagcgttg cgtttgaaac tacaaagca
us-10-659-983a-20   ctgggcgcga tacgtcagat taagcgttg cgtttgaaac tacaaggca
us-10-659-983a-19   ctgggcagga agcgtcgcga taagcgttg cgtttgaaac tacaagca
us-10-659-983a-3    ctggggaactg agcgtcgcga taagcgttg cgtttgaaac tacaaggca
us-10-659-983a-4    ctgggaactg agcgtcgcga taagcgttg cgtttgaaac tacaaggca

601                                                            650
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us-10-659-983a-19   cggcttaac gaattccatg cgttgaaac cgttgaaatccc gagtgtggca
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651                                                            700
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us-10-659-983a-18   gagggggtg gaattccatg tgtagcagtg aaatgcgtag agatgtggaa
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us-10-659-983a-19   gaggggggtg gaattccatg tgtagcagtg aaatgcgtag agatgtggag
us-10-659-983a-3    gagggggtg gaattccacg tgtagcagtg aaatgcgtag agatgtggag
us-10-659-983a-4    gagggggtg gaattccacg tgtagcagtg aaatgcgtag agatgtggag
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Left column (positions 701–1150):

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us-10-659-983a-4   accctgtca ctaatctgca ctatctaa tgagctcaa tggcacttt agtgagactg

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OLDDISTANCES within: us*   April 6, 2006 16:34

Threshold of comparison: 1
    Denominator: "Length of shorter sequence"
   Number of sequences: 7
Symbol Comparison Table: GenRunData:dnadistances.cmp

Key for column and row indices:

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2	us-10-659-983a-18	Length: 1467	Length without gaps:	1467
3	us-10-659-983a-19	Length: 1494	Length without gaps:	1494
4	us-10-659-983a-2	Length: 1457	Length without gaps:	1457
5	us-10-659-983a-20	Length: 1491	Length without gaps:	1491
6	us-10-659-983a-3	Length: 1458	Length without gaps:	1458
7	us-10-659-983a-4	Length: 1460	Length without gaps:	1460

Distance Matrix Part: 1

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3			1.0000	0.2690	0.2649	0.2785	0.2610
4				1.0000	0.2663	0.2677	0.2876
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6						1.0000	0.3258
7							1.0000

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; Sequence 1, Application US/10659983A
; GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-284779
;   CURRENT APPLICATION NUMBER: US/10/659,983A
;   CURRENT FILING DATE: 2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE: 2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,218
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,219
;   PRIOR FILING DATE: 2002-09-19
;   NUMBER OF SEQ ID NOS: 23
;   SOFTWARE: PatentIn version 3.2
;
; SEQ ID NO 1
;   LENGTH: 1457
;   TYPE: DNA
;   ORGANISM: Unknown
;   FEATURE:
;   OTHER INFORMATION: AOB Type A R7clone140 16S rDNA
US-10-659-983A-1

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; Sequence 2, Application US/10659983A
; GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-284779
;   CURRENT APPLICATION NUMBER: US/10/659,983A
;   CURRENT FILING DATE: 2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE: 2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,218
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,219
;   PRIOR FILING DATE: 2002-09-19
;   NUMBER OF SEQ ID NOS: 23
;   SOFTWARE: PatentIn version 3.2
;
; SEQ ID NO 2
;   LENGTH: 1457
;   TYPE: DNA
;   ORGANISM: Unknown
;   FEATURE:
;   OTHER INFORMATION: AOB Type A1 R7clone187 16S rDNA
US-10-659-983A-2

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US10659983A.seq

Thu Apr 6 09:55:36 2006

Sequence 3, Application US/10659983A
; GENERAL INFORMATION:
; APPLICANT: Hovanec, Timothy A
; TITLE OF INVENTION: Ammonia-Oxidizing Bacteria
; FILE REFERENCE: 81289-284779
; CURRENT APPLICATION NUMBER: US/10/659,983A
; CURRENT FILING DATE: 2003-09-10
; PRIOR APPLICATION NUMBER: US 09/573,684
; PRIOR FILING DATE: 2000-05-19
; PRIOR APPLICATION NUMBER: US 60/386,217
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,218
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,219
; PRIOR FILING DATE: 2002-09-19
; NUMBER OF SEQ ID NOS: 23
; SOFTWARE: PatentIn version 3.2
;
; SEQ ID NO 3
; LENGTH: 1458
; TYPE: DNA
; ORGANISM: Unknown
; FEATURE:
; OTHER INFORMATION: AOB Type B R3clone5 16S rDNA
US-10-659-983A-3

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Sequence 4, Application US/10659983A
; GENERAL INFORMATION:
; APPLICANT: Hovanec, Timothy A
; TITLE OF INVENTION: Ammonia-Oxidizing Bacteria
; FILE REFERENCE: 81289-284779
; CURRENT APPLICATION NUMBER: US/10/659,983A
; CURRENT FILING DATE: 2003-09-10
; PRIOR APPLICATION NUMBER: US 09/573,684
; PRIOR FILING DATE: 2000-05-19
; PRIOR APPLICATION NUMBER: US 60/386,217
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,218
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,219
; PRIOR FILING DATE: 2002-09-19
; NUMBER OF SEQ ID NOS: 23
; SOFTWARE: PatentIn version 3.2
;
; SEQ ID NO 4
; LENGTH: 1460
; TYPE: DNA
; ORGANISM: Unknown
; FEATURE:
; OTHER INFORMATION: AOB Type C R5clone47 16D rDNA
US-10-659-983A-4

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;   Sequence 18, Application US/10659983A
;   GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-284779
;   CURRENT APPLICATION NUMBER: US/10/659,983A
;   CURRENT FILING DATE:  2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE:  2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE:  2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,218
;   PRIOR FILING DATE:  2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,219
;   PRIOR FILING DATE:  2002-09-19
;   NUMBER OF SEQ ID NOS: 23
;   SOFTWARE: PatentIn version 3.2
;   SEQ ID NO 18
;     LENGTH: 1467
;     TYPE: DNA
;     ORGANISM: Unknown
;     FEATURE:
;     OTHER INFORMATION: N. Aestuarii-like AOB P4clone42 16S rDNA
US-10-659-983A-18
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;   Sequence 19, Application US/10659983A
;   GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-284779
;   CURRENT APPLICATION NUMBER: US/10/659,983A
;   CURRENT FILING DATE:  2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE:  2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE:  2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,218
;   PRIOR FILING DATE:  2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,219
;   PRIOR FILING DATE:  2002-09-19
;   NUMBER OF SEQ ID NOS: 23
;   SOFTWARE: PatentIn version 3.2
;   SEQ ID NO 19
;     LENGTH: 1494
;     TYPE: DNA
;     ORGANISM: Unknown
;     FEATURE:
;     OTHER INFORMATION: N. Aestuarii-like AOB P4clone31 16S rDNA
US-10-659-983A-19
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; Sequence 20, Application US/10659983A
; GENERAL INFORMATION:
; APPLICANT: Hovanec, Timothy A
; TITLE OF INVENTION: Ammonia-Oxidizing Bacteria
; FILE REFERENCE: 81289-284779
; CURRENT APPLICATION NUMBER: US/10/659,983A
; CURRENT FILING DATE: 2003-09-10
; PRIOR APPLICATION NUMBER: US 09/573,684
; PRIOR FILING DATE: 2000-05-19
; PRIOR APPLICATION NUMBER: US 60/386,217
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,218
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,219
; PRIOR FILING DATE: 2002-09-19
; NUMBER OF SEQ ID NOS: 23
; SOFTWARE: PatentIn version 3.2
;
; SEQ ID NO 20
;   LENGTH: 1491
;   TYPE: DNA
;   ORGANISM: Unknown
;   FEATURE:
;   OTHER INFORMATION: N. Aestuarii-like AOB BF16clone57 16S rDNA

US-10-659-983A-20

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948_genalign.rec

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> o <
o | |o   IntelliGenetics
> o <

GENALIGN - Multiple Sequence Alignment Program
Release 5.4

Thu 6 Apr 106 9:59:08-PST

Solution Parameters:

    Nucleic Alphabet    = Identity
    Output line length  = 80
    Compress            = Off
    Histogram           = Off
    Randomization       = Off

    AMINO-Res-length    = 2
    DELetion-weight     = 5.00
    LEngth-factor       = 0
    Matching-weight     = 1.00
    NUCLEIC-Res-length  = 4
    SPread-factor       = 50

Clustered order of selected sequences:

    4. US-10-659-948A-4    (1-1460)
    3. US-10-659-948A-3    (1-1458)
    1. US-10-659-948A-1    (1-1457)
    2. US-10-659-948A-2    (1-1457)
    5. US-10-659-948A-18   (1-1467)
    7. US-10-659-948A-20   (1-1491)
    6. US-10-659-948A-19   (1-1494)
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US-10-659-  610  CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTGTAGCAGAGGGGGTGGAATTCCATG
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consensus        CCTGGGAAcTGCGTTTGAAACTACAAaGCTAGAGTGtaGCAGAGGGgGTGGAATTCCAcG

US-10-659-  650  TGTAGCAGTGAAATGCGTAGAGATGTGGAaGAACACCGATGGCGAAGGCAGCtCCCTGGGT
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US-10-659-  651  TGTAGCAGTGAAATGCGTAGAGATGTGGAGGAACACCGATGGCGAAGGCAGCCCCCTGGGT
US-10-659-  653  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAAGGCAGCCCCCTGGGT
US-10-659-  653  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAAGGCAGCCCCCTGGGT
US-10-659-  667  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAAGGCAGCCCCCTGGGT
US-10-659-  670  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAAGGCAGCCCCCTGGGT
US-10-659-  671  TGTAGCAGTGAAATGCGTAGAGATATGGAAGAACATCGATGGCGAAGGCAGCCCCCTGGGT
consensus        TGTAGCAGTGAAATGCGTAGAGATaTGGaaGAACAtCGATGGCGAAGGCAGCcCCCTGGGT

US-10-659-  711  TgACTGACGCTCAtGCACGAAAGCGTGGGGAGCAAACGAGATTAGATACCCTGGTAGTC
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US-10-659-  712  TAACACcGACGCTCagGCaCAGAAAGCGTGGGGAGCAAACGAGATTAGATACCCTGGTAGTC
US-10-659-  714  TAACACTGACGCTCATGCACGAAAGCGTGGGGAGCAAACAGAGATTAGATACCCTGGTAGTC
US-10-659-  714  TAACACTGACGCTCATGCACGAAAGCGTGGGGAGCAAACAGAGATTAGATACCCTGGTAGTC
US-10-659-  728  TAACACTGACGCTCATGCACGAAAGCGTGGGGAGCAAACAGAGATTAGATACCCTGGTAGTC
US-10-659-  731  TAACACTGACGCTCATGCACGAAAGCGTGGGGAGCAAACAGAGATTAGATACCCTGGTAGTC
US-10-659-  732  TAACACTGACGCTCATGCACGAAAGCGTGGGGAGCAAACAGAGATTAGATACCCTGGTAGTC
consensus        TaACtGACGCTCATGCACGAAAGCGTGGGGAGCAAACAGGATTAGATACCCTGGTAGTC

US-10-659-  772  CACGCCCTAAACGATGTCAACTGGTTGTCGGATcTaaTCAaGGACTTGGTAACGcAGCTAA
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US-10-659-  773  GTCTTAACGACTTGGTAACGCAGCTAA
US-10-659-  775  CACGCCCTAAACGATGTCAACTGTTGGGCCTTATTAGGCTTGGTAACGAAGCTAA
US-10-659-  775  CACGCCCTAAACGATGTCAACTAGTTGTCG    GCCTTAGGCTTGGTAACGAAGCTAA
US-10-659-  789  CACGCCCTAAACGATGTCAACTAGTTGTCGG   GCCTTACTAGGCTTGGTAACGTAGCTAA
US-10-659-  792  CACGCCCTAAACGATGTCAACTAGTTGTTGG   GCCTTACGTAGGCTTGGTAACGTAGCTAA
US-10-659-  793  CACGCCCTAAACGATGTCAACTAGTTGTTGG   GCCTTACTAGGCTTGGTAACGTAGCTAA
consensus        CACGCCCTAAACGATGTCAACTAGTTGTTGG   GCCTTACGTAGGCTTGGTAACGTAGCTAA

US-10-659-  833  CGCGGTGAAGTTGaCCGCCGCCTTGGGGAGTACGGTCGCAAGAGGGGAGGAGTGGAATTGACGG
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US-10-659-  832  CGCGGTGAAGTTGGCGCCGCCTTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-  834  CGCGGTGAAGTTGACCGCCGCCTTGGGGAGTACGGCCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-  834  CGCGGTGAAGTTGACCGCCGCCTTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-  848  CGCGGTGAAGTTGACCGCCGCCTTGGGGAGTACGGTCGCAqGATTAAAACTCAAAGGAATTGACGG
US-10-659-  851  CGCGGTGAAGTTGACCGCCGCCTTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
US-10-659-  852  CGCGGTGAAGTTGACCGCCGCCTTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
consensus        CGCGGTGAAGTTGaCCGCCGCCTTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGG
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US-10-659-  364  GAAAGCCTGATCCAGCAATGCCGCGTGAGTGAAGAAGG   C TTCGGGTTGTAAAGCTCTTT
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US-10-659-  366  GAAAGCCTGATCCAGCAATGCCGCGTGAGTGAAGAAGG       CCTTCGGGTTGTAAAGCTCTTT
US-10-659-  367  GAAAGCCTGATCCAGCAATGCCGCGTGAGTGAAGAAGG       CCTTCGGGTTGTAAAGCTCTTT
consensus        GaAAgCCTGATCCAGCAATGCCGCGTGAGTGAAGAAGGcCCTTCGGGTTGTAAAGCTCTTT

US-10-659-  406  tAGTcCagAaGAAGaaTCAtGatgaAATaattaTGAtTTaTGACGGTACTgAcGAGAAaAAG
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US-10-659-  407  CAGCCGGAACGAACGAAAGTCACGCGTCACGTGACTGACTGACTGACGGTATCGACAGGAGAAG
US-10-659-  409  CAGTCGAGAGAGAAGAAAGGTTACGGTGAAATAATCGTGACCCATGACGGTATCGCACAGAGAAG
US-10-659-  409  CAGTCGAGAGAGAAGAAAGGTTACGGTGAAATAATCGTGACCCATGAtGGTATCGCACAGAGAAG
US-10-659-  423  CAGTCGAGAGAGAAGAAAGGTTGACTAATTaTCACAACTTATGACGGTACCGAcACAGAGAAG
US-10-659-  426  CAGTCGAGAGAGAAGAAAGGTTGTGACTAATTaTCACAACTTATGACGGTACCGAcACAGAGAAG
US-10-659-  427  CAGTCGAGAGAGAAGAAAGGTTGTGACTAATTaTCACAACTTaTCACGGGTAccGacAGAGAgAAG
consensus        cAGtCgagAaGAAGaaAAAggTTcatGactaAtTAatcatgActTaTGACGGTAccGacAGAGAAG

US-10-659-  467  CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCgAGCGTTAATCGGAAT
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US-10-659-  468  CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCAAGCGTTAATCGGAAT
US-10-659-  470  CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCAAGCGTTAATCGGAAT
US-10-659-  470  CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCAAGCGTTAATCGGAAT
US-10-659-  484  CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCAAGCGTTAATCGGAAT
US-10-659-  487  CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCAAGCGTTAATCGGAAT
US-10-659-  488  CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCCaAGCGTTAATCGGAAT
consensus        CACCGGCTAACTACGTGCCAGCAGCCGCGGGTAATACGTAGGGTGCaAGCGTTAATCGGAAT

US-10-659-  528  TACTGGGCGTAAAggTGCGCAGGCGGTTTGTGAAGTCAGATGTGAAAGCCCCGGGCTTAA
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US-10-659-  529  TACTGGGCGTAAAGCGTGCGCAGGCGGTTTGTGAAGTCAGATGTGAAAGCCCCGGGCTTAA
US-10-659-  531  TACTGGGCGTAAAGGGTGCGCAGGCGGCCTTGTGAAGTCAGATGTGAAAGCCCCGGGCTTAA
US-10-659-  531  TACTGGGCGTAAAGGGTGCGCAGGCGGCCTTGTGAAGTCAGATGTGAAATCCCCGGGCTTAA
US-10-659-  545  TACTGGGCGTAAAGGGTGCGCAGGCGGCCTTGTGAAGTCAGATGTGAAATCCCCGGGCTTAA
US-10-659-  548  TACTGGGCGTAAAGGGTGCGCAGGCGGCCTTGTGAAGTCAGATGTGAAATCCCCGGGCTTAA
US-10-659-  549  TACTGGGCGTAAAGGGTGCGCAGGCGGcctTGTGAAGTCAGATGTGAAAtCCCCGGGCTTAA
consensus        TACTGGGCGTAAAggGTGCGCAGGCGGCCTTGTGAAGTCAGATGTGAAAtCCCCGGGCTTAA

US-10-659-  589  CCTGGGAAcTGCGTTTGAAACTACAAAGCTAGAGTGtCagGCAGAGGGgaGTGGAATTCCAtg
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US-10-659-  590  CCTGGGAAcTGCGTTTGAAACTACACAAGCTAGAGTGtGGCAGAGAGTGGGTGGAATTCCACG
US-10-659-  592  CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTGtGGCAGAGGGGTGGAATTCCATG
US-10-659-  592  CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTGtGGCAGAGGGGTGGAATTCCATG
US-10-659-  606  CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTGtGGCAGAGGGGTGGAATTCCATG
US-10-659-  609  CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTGtAGCAGAGGGGTGGAATTCCATG
consensus        CCTGGGAATTGCGTTTGAAACTACAAAGCTAGAGTGtAGCAGAGGGGTGGAATTCCATG
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Thu Apr 6 10:00:24 2006

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US-10-659-  894   GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
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US-10-659-  893   GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
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US-10-659-  895   GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  895   GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  909   GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  912   GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659-  913   GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus         GGACCCGCACAAGCGGTGGATTATGTGGATTAATTCGATGCAACGCGAAAAACCTTACCTA

US-10-659-  955   CCCTTGACATGcttgGAAcCtagGtgGAGAcaTaagaGTG   CCCGAAAAGGGAGCcaagACAC
                  ||||||||||||||| |||   |||| ||| ||   |||    |||||| ||||||
US-10-659-  954   CCCTTGACATGTACCGAgcCCcGGccGAggTggGtGTG     CCCGAAAAGGGAGCCgTAACAC
                  |||||||||||||                   |||||||    ||
US-10-659-  956   CCCTTGACATGTAGCGAATTTTCTAGAGATAGATTAGTG C  TTCGGGAACGCTAACAC
                  |||||||||||||||||||    |||||||||||||||||   ||||||||||||||||
US-10-659-  956   CCCTTGACATGTAGCGAATTTTCTAGAGATAGATTAGTG C  TTCGGGAACGCTAACAC
                  |||||||||||||||||||    |||||||||||||||||   ||||||||||||||||
US-10-659-  970   CCCTTGACATGTAGCGAATATTTTAGAGATAAAATAGTGCC  TTCGGGAACGCTAACAC
                  ||||||||||||||||||||    |||||||||||||||||| ||||||||||||||||
US-10-659-  973   CCCTTGACATGTAGCGAATATTTTAGAGATAAAATAGTGCC  TTCGGGAACGCTAACAC
                  ||||||||||||||||||||    |||||||||||||||||| ||||||||||||||||
US-10-659-  974   CCCTTGACATGTAGCGAATATTTTAGAGATAAAATAGTGCC  TTCGGGAACGCTAACAC
                  ||||||||||||||||||||    |||||||||||||||||| ||||||||||||||||
consensus         CCCTTGACATGtagcGAAtatttagAGAGataaaataGTGcccgttcgGGaacGctaaACAC

US-10-659- 1015   AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1014   AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1013   AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1013   AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1028   AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1031   AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1032   AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus         AGGTGCTGCATGGCTGTCGTCAGCTCGTGTCGTGAGATGTTGGGTTAAGTCCCGCAACGAG

US-10-659- 1076   CGCAACCCTTGTCAcTAAtTGCtATCATTCtAaaTGaGaCACTTTAgTGAgACTGCCGGTGA
                  |||||||||||||                 ||   |||| | |||   ||| ||||||||||
US-10-659- 1075   CGCAACCCTTGTCATTCATTCATTCATTC  AGTTGGGCACTTTAATGAaACTGCCGGTGA
                  |||||||||||||                  ||| ||||||||||| ||| ||||||||||
US-10-659- 1074   CGCAACCCTTGTCATTAATTGCCATCATT  TGGTTGGGCACTTTAATGAGACTGCCGGTGA
                  |||||||||||||||||||||||||||||  |||||||||||||||||||||||||||||||
US-10-659- 1074   CGCAACCCTTGTCATTAATTGCCATCATT  TGGTTGGGCACTTTAATGAGACTGCCGGTGA
                  |||||||||||||||||||||||||||||  |||||||||||||||||||||||||||||||
US-10-659- 1089   CGCAACCCTTGTCATTAATTGCCATCATT  TAGTTGGGCACTTTAATGAGACTGCCGGTGA
                  |||||||||||||||||||||||||||||  |||||||||||||||||||||||||||||||
US-10-659- 1092   CGCAACCCTTGTCATTAATTGCCATCATT  TAGTTGGGCACTTTAATGAGACTGCCGGTGA
                  |||||||||||||||||||||||||||||  |||||||||||||||||||||||||||||||
US-10-659- 1093   CGCAACCCTTGTCAcTAAtTGCCATCATTCtcagtTGgGCACTTTAaTGAgACTGCCGGTGA
                  ||||||||||||||                 ||   |||||||||| ||| ||||||||||
consensus         CGCAACCCTTGTCATTAATTGCCATCATTCtcagtTGGGCACTTTAATGAGACTGCCGGTGA

US-10-659- 1137   CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1135   CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1134   CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC
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US-10-659- 1134   CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC
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US-10-659- 1149   CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1152   CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1153   CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus         CAAACCGGAGGAAGGTGGGGATGACGTCAAGTCCTCATGGCCCTTATGGGTAGGGGCTTCAC

US-10-659- 1198   ACGTAATACAATGGCtGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCaAATCTCAGAAA
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US-10-659- 1196   ACGTAATACAATGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCtAATCTCAGAAA
                  |||||||||||||||||||||||||||||||||||||||||||||||  |||||||||||
US-10-659- 1195   ACGTAATACAATGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCtAATCTCAGAAA
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US-10-659- 1195   ACGTAATACAATGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCtAATCTCAGAAA
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US-10-659- 1210   ACGTAATACAATGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA
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US-10-659- 1213   ACGTAATACAATGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA
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US-10-659- 1214   ACGTAATACAATGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCTAATCTCAGAAA
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consensus         ACGTAATACAATGGCGGTACAGAGGGTTGCCAACCCGCGAGGGGGAGCtAATCTCAGAAA

US-10-659- 1259   GCaCGTCGTAGTCCGGATCGGAGTCGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA
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US-10-659- 1257   GCGCGTCGTAGTCCGGATCGGAGTCGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA
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US-10-659- 1256   GCGCGTCGTAGTCCGGATCGGAGTCGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA
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US-10-659- 1256   GCGCGTCGTAGTCCGGATCGGAGTCGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA
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US-10-659- 1271   GCGCGTCGTAGTCCGGATTCGGAGTCGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA
                  |||||||||||||||||| |||||||||||||||||||||||||||||||||||||||||
US-10-659- 1274   GCGCGTCGTAGTCCGGATCGGAGTtaGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA
                  |||||||||||||||||||||||||  ||||||||||||||||||||||||||||||||||
US-10-659- 1275   GCGCGTCGTAGTCCGGATCGGAGTCGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus         GCgCGTCGTAGTCCGGATCGGAGTcGCAACTCGACTCCGTGAAGTCGGAATCGCTAGTAA

US-10-659- 1320   TCGCGGATCAGCATGCCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC
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US-10-659- 1318   TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1317   TCGCGGATCAGCATGCCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC
                  ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1317   TCGCGGATCAGCATGCCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC
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US-10-659- 1332   TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1335   TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1336   TCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
consensus         TCGCGGATCAGCATGCCGCGGTGAATACGTTCCCGGGTCTTGTACACACCGCCCGTCACAC

US-10-659- 1381   CATGGGAGTGGGTTTCACCAGAAGCAGGTAGTtTAACGtaAGGAGaCGCTTGCCACGGT
                  |||||||||||||||||||||||||||||||| ||||||  |||| ||||||||||||||
US-10-659- 1379   CATGGGAGTGGGTTTCACCAGAAGCAGGTAGTCTAACGGtCTAACCGCGCTTGCCACGGT
                  ||||||||||||||||||||||||||||||||||||||  |||||||||||||||||||
US-10-659- 1378   CATGGGAGTGGGTTTCACCAGAAGCAGGTAGTCTAACCGTCTAACCGCGCTTGCCACGGT
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1378   CATGGGAGTGGGTTTCACCAGAAGCAGGTAGTCTAACCGTCTAACCGCGCTTGCCACGGT
                  |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
US-10-659- 1393   CATGGGAGTGGGTTTCACCAGAAGCAGGTAGTCTAACCGTCTAACCGTAAG AGGGCGTTGCCACGGc
                  ||||||||||||||||||||||||||||||||||||||| |||||     |||||||||
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US-10-659- 1396  CATGGGAGTGGGTTTCACCAGAAGCAGATAGTCTAACCGTAAGGAGGGCGTTTGCCACGGT
                 |||||| |||  || |||||||||||||||||||||||  | ||||| || || |||||||
US-10-659- 1397  CATGGaAGTtGGcTgCACCAGAAGCtAGGtGTCTAACCcTcgGGAGGaCGcTTaCCACGGT

consensus        CATGGgAGTgGgTtCACCAGAAGCAGgTaGTCTAACCgTaaGGAGGaCGcTTgCCACGGt


US-10-659- 1442  GgGggTCATGAC  TGGGGTG
                 | |  |||||||  |||||||
US-10-659- 1440  GAGATTCATGAC  TGGGGTG
                 |||||||||||||  |||||||
US-10-659- 1439  GAGATTCATGAC  TGGGGTG
                 |||||||||||||  |||||||
US-10-659- 1439  GAGATTCATGAC  TGGGGTG
                 ||||||||||||  |||
US-10-659- 1453  GAGATTCATGAC  TGG
                 ||||||||||||  ||
US-10-659- 1457  GAGATTCATGAC  TGGGGTGAAGTCGTAACAAttTA
                 |  ||||||||||  |||||||||||||||||||||  ||
US-10-659- 1458  GtGgTcaATGACtTGGGGTGAAGTCGTAACAAggTAa

consensus        GaGattCATGACtTGGggtgaagtcgtaacaa--taa
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Alignment score = 7466.00

Scoring matrix:

	1	2	3	4	5	6	7
1		1454	1338	1300	1304	1220	1253
2			1335	1297	1303	1219	1252
3				1317	1226	1145	1177
4					1185	1111	1139
5						1304	1344
6							1450
7							

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!!NA_MULTIPLE_ALIGNMENT 1.0
PileUp of: ub*

Symbol comparison table: GenRunData:pileupdna.cmp   CompCheck: 6876

          GapWeight: 5
    GapLengthWeight: 0

948_pileup.msf  MSF: 1499  Type: N  April 6, 2006 09:59  Check: 4192 ..

Name: us-10-659-948a-1    Len: 1499  Check: 4465  Weight: 1.00
Name: us-10-659-948a-2    Len: 1499  Check: 4156  Weight: 1.00
Name: us-10-659-948a-18   Len: 1499  Check: 2795  Weight: 1.00
Name: us-10-659-948a-20   Len: 1499  Check: 4660  Weight: 1.00
Name: us-10-659-948a-19   Len: 1499  Check: 3089  Weight: 1.00
Name: us-10-659-948a-3    Len: 1499  Check: 3801  Weight: 1.00
Name: us-10-659-948a-4    Len: 1499  Check: 1226  Weight: 1.00

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; Sequence 1, Application US/10659948A
; GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Method of Using Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-294309
;   CURRENT APPLICATION NUMBER: US/10/659,948A
;   CURRENT FILING DATE: 2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE: 2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,218
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,219
;   PRIOR FILING DATE: 2002-09-19
;   NUMBER OF SEQ ID NOS: 23
;   SOFTWARE: PatentIn version 3.2
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; SEQ ID NO 1
;   LENGTH: 1457
;   TYPE: DNA
;   ORGANISM: Unknown
;   FEATURE:
;   OTHER INFORMATION: AOB Type A R7clone140 16S rDNA
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; Sequence 2, Application US/10659948A
; GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Method of Using Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-294309
;   CURRENT APPLICATION NUMBER: US/10/659,948A
;   CURRENT FILING DATE: 2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE: 2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE: 2002-09-19
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;   PRIOR FILING DATE: 2002-09-19
;   NUMBER OF SEQ ID NOS: 23
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; Sequence 3, Application US/10659948A
; GENERAL INFORMATION:
; APPLICANT: Hovanec, Timothy A
; TITLE OF INVENTION: Method of Using Ammonia-Oxidizing Bacteria
; FILE REFERENCE: 81289-294309
; CURRENT APPLICATION NUMBER: US/10/659,948A
; CURRENT FILING DATE: 2003-09-10
; PRIOR APPLICATION NUMBER: US 09/573,684
; PRIOR FILING DATE: 2000-05-19
; PRIOR APPLICATION NUMBER: US 60/386,217
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,218
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,219
; PRIOR FILING DATE: 2002-09-19
; NUMBER OF SEQ ID NOS: 23
; SOFTWARE: PatentIn version 3.2
;
; SEQ ID NO 3
; LENGTH: 1458
; TYPE: DNA
; ORGANISM: Unknown
; FEATURE:
; OTHER INFORMATION: AOB Type B R3clone5 16S rDNA
US-10-659-948A-3

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; Sequence 4, Application US/10659948A
; GENERAL INFORMATION:
; APPLICANT: Hovanec, Timothy A
; TITLE OF INVENTION: Method of Using Ammonia-Oxidizing Bacteria
; FILE REFERENCE: 81289-294309
; CURRENT APPLICATION NUMBER: US/10/659,948A
; CURRENT FILING DATE: 2003-09-10
; PRIOR APPLICATION NUMBER: US 09/573,684
; PRIOR FILING DATE: 2000-05-19
; PRIOR APPLICATION NUMBER: US 60/386,217
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,218
; PRIOR FILING DATE: 2002-09-19
; PRIOR APPLICATION NUMBER: US 60/386,219
; PRIOR FILING DATE: 2002-09-19
; NUMBER OF SEQ ID NOS: 23
; SOFTWARE: PatentIn version 3.2
;
; SEQ ID NO 4
; LENGTH: 1460
; TYPE: DNA
; ORGANISM: Unknown
; FEATURE:
; OTHER INFORMATION: AOB Type C R5clone47 16S rDNA
US-10-659-948A-4

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; Sequence 18, Application US/10659948A
; GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Method of Using Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-294309
;   CURRENT APPLICATION NUMBER: US/10/659,948A
;   CURRENT FILING DATE: 2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE: 2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,218
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,219
;   PRIOR FILING DATE: 2002-09-19
;   NUMBER OF SEQ ID NOS: 23
;   SOFTWARE: PatentIn version 3.2
; SEQ ID NO 18
;   LENGTH: 1467
;   TYPE: DNA
;   ORGANISM: Unknown
;   FEATURE:
;   OTHER INFORMATION: N. Aestuarii-like AOB P4clone42 16S rDNA
US-10-659-948A-18

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; Sequence 19, Application US/10659948A
; GENERAL INFORMATION:
;   APPLICANT: Hovanec, Timothy A
;   TITLE OF INVENTION: Method of Using Ammonia-Oxidizing Bacteria
;   FILE REFERENCE: 81289-294309
;   CURRENT APPLICATION NUMBER: US/10/659,948A
;   CURRENT FILING DATE: 2003-09-10
;   PRIOR APPLICATION NUMBER: US 09/573,684
;   PRIOR FILING DATE: 2000-05-19
;   PRIOR APPLICATION NUMBER: US 60/386,217
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,218
;   PRIOR FILING DATE: 2002-09-19
;   PRIOR APPLICATION NUMBER: US 60/386,219
;   PRIOR FILING DATE: 2002-09-19
;   NUMBER OF SEQ ID NOS: 23
;   SOFTWARE: PatentIn version 3.2
; SEQ ID NO 19
;   LENGTH: 1494
;   TYPE: DNA
;   ORGANISM: Unknown
;   FEATURE:
;   OTHER INFORMATION: N. Aestuarii-like AOB P4clone31 16S rDNA
US-10-659-948A-19

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;  Sequence 20, Application US/10659948A
;  GENERAL INFORMATION:
;  APPLICANT: Hovanec, Timothy A
;  TITLE OF INVENTION: Method of Using Ammonia-Oxidizing Bacteria
;  FILE REFERENCE: 81289-294309
;  CURRENT APPLICATION NUMBER: US/10/659,948A
;  CURRENT FILING DATE: 2003-09-10
;  PRIOR APPLICATION NUMBER: US 09/573,684
;  PRIOR FILING DATE: 2000-05-19
;  PRIOR APPLICATION NUMBER: US 60/386,217
;  PRIOR FILING DATE: 2002-09-19
;  PRIOR APPLICATION NUMBER: US 60/386,218
;  PRIOR FILING DATE: 2002-09-19
;  PRIOR APPLICATION NUMBER: US 60/386,219
;  PRIOR FILING DATE: 2002-09-19
;  NUMBER OF SEQ ID NOS: 23
;  SOFTWARE: PatentIn version 3.2
;  SEQ ID NO 20
;    LENGTH: 1491
;    TYPE: DNA
;    ORGANISM: Unknown
;    FEATURE:
;    OTHER INFORMATION: N. Aestuarii-like AOB BF16clone57 16S rDNA
US-10-659-948A-20

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